Savings Determinants of Moroccan banks: A cointegration modeling approach

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ABSTRACT: The present paper examines the existence or not of long run relationship between bank-specific and macroeconomic variables and savings in Moroccan banks using cointegration approach and aims to identify the determinants of Moroccan banks' savings. We first use Augmented Dickey Fuller (DICKEY and FULLER, 1979) test and PHILLIPS-PERON (PP) unit root test to test the stationary. As all the variables are integrated of the order 1, we apply JOHANSEN JUSELIUS cointegration test to test the cointagration and to evaluate the existence of long-run relationship between the variables. The presence of cointegration between deposits and others variables provide evidence that these variables share a long-run relationship. Therefore, it concludes that there is a long run equilibrium governing the relationship among the variables.

KEYWORDS: Savings, Moroccan banks, cointegration modeling approach.

1 INTRODUCTION

Saving is defined as the excess of income over consumption, naturally follows (KEYNES, 2006). Thus, as the main activity of banks is to receive deposits from agents in excess of funds (and lend money to agents in need), deposits are the main and major source of funds for banks.

KEYNES defined three motives why people hold money: transactions, precautionary and investment motives. The author lists eight motives which lead individuals to refrain from spending out of their incomes and thus to save: to build up a reserve against unforeseen contingencies; to provide for an anticipated future relationship between the income and the needs of the individual; to enjoy interest and appreciation; to enjoy gradually increasing expenditure; to enjoy a sense of independence and the power to do things, though without a clear idea or definite intention of specific action; to secure a *masse de manœuvre* to carry out speculative or business projects; to bequeath a fortune and finally, to satisfy pure miserliness, i.e., unreasonable but insistent inhibitions against acts of expenditure as such. BROWNING and LUSARDI (1996) add to this list another motive which is the accumulation of deposits to buy houses, cars and other durables.

The aim of the present paper is to identify the determinants of Moroccan banks' savings and to examine the existence or not of long run relationship between bank-specific and macroeconomic variables and savings in Moroccan banks using cointegration approach.

The paper is organized as follows. In section 2, we review the existing literature on bank's determinants of savings. Methodology adopted and data used are presented in section 3 while results obtained are presented in section 4. Finally, section 5 offers conclusions.

2 LITERATURE REVIEW

The main studies on determinants of savings in banks were conducted by LAMBERT and HOSELITZ (1963), JUSTER and WACHTEL (1972), WILLIAMS and DEFRIS (1981), DOSHI (1994), MASSON et al. (1998), CARDEAS and ESCOBAR (1998), LOAYZA and SHAKAR (2000), LOAYZA et al. (2000), SARANTIS and STEWART (2001), AGRAWAL (2001), KIIZA and PEDERSON (2001), ROSENZWEIF (2001), ATHUKORALA and SEN (2003), DADZIE et al. (2003), OZCAN et al. (2003), ATHUKORALA and TSAI (2003),

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COHN and KOLLURI (2003), HONDROYIANNIES (2004), HARALD and HEIKO (2009), ORJI (2012), KANJ and EL KHOURY (2013), BECKMANN et al. (2013), ROHMAH (2006), ZAINOL and KASIM (2010).

Thus, LAMBERT and HOSELITZ (1963) reviewed different works on savings behavior Ceylo (now Sri Lanka), Hong Kong, Malaya (now Malaysia), Pakistan, India, Philippines and Vietnam. JUSTER and WACHTEL (1972) analyzed US households savings. They found that unanticipated inflation tend to increase households saving while fully anticipated inflation is tend to decrease it. In Australia, WILLIAMS and DEFRIS (1981) found that households' consumption is significantly affected by inflation, unemployment, general consumer sentiment and perceived seriousness of inflation. DOSHI (1994) examined the effect of population growth and productivity growth on savings in 129 countries. The author found that savings are positively correlated with life expectancy in less developed countries and the inverse relationship was recorded for the high-income countries. MASSON et al. (1998) examined the determinants of private savings behavior of industrial and developing countries and found that demographic factors were important in determining the saving rates. They also found that GDP growth, real interest rate, and changes in the term of trades were positively correlated to saving. The level of foreign savings was found to have an inverse relationship with savings in the developing countries. CARDEAS and ESCOBAR (1998) studied the savings behavior in Colombia and found that higher government expenditure led to the decreasing national savings; that saving and investment were perfectly correlated and savings caused growth; and that higher taxation, urbanization and age dependency had negative effect on savings. LOAYZA and SHAKAR (2000) used cointegration approach to measure the relationship between savings in India. They found that real interest rate, per capita income and the share of agriculture in gross domestic product GDP had a positive relationship with savings while financial development, inflation and dependency ratio had a negative relationship with savings. LOAYZA et al. (2000) examined the effects of policy and non-policy variables on savings. They found that private saving rates are highly serially correlated; that positive saving rates with the level and growth rate of real per capita income and the influence of income are larger in developing than in developed countries and that inflation had a positive impact on savings. SARANTIS and STEWART (2001) studied the savings behavior in OECD. They found that government deficit does not increase savings. AGRAWAL (2001) studied the relationship between saving and growth in seven Asian countries (South Korea, Taiwan, Singapore, Malaysia, Thailand, Indonesia, and India) and found that both high rate of growth of income per capita, and the rapidly declining age dependency ratio contributed to the high rate of saving in the studied countries. Interest rate was found to be positively correlated with savings for Malaysia and Thailand and negative for Indonesia. KIIZA and PEDERSON (2001) studied determinants of savings in Uganda. They found that the availability of information, the accessibility of the saving facilities, level of education of the head of the household and the density of financial institution could influence customers to start savings while the availability of credit facilities, lower transaction costs, and higher permanent income were positively correlated to savings level. ROSENZWEIF (2001) studied the savings behavior of household in Thailand and found that the inefficient savings facility had influence the level of saving among farmers and the life-cycle model was not applicable to this group. ATHUKORALA and SEN (2003) found that rate of growth, real interest rate on bank deposits, spread of banking facilities and inflation were positively correlated with savings. DADZIE et al. (2003) studied determinants of savings in Ghana. They found that level of income, customer satisfaction, service quality and demographic factors such as number of dependents and location were positively correlated with the level of savings while age and formal education variables were found to be insignificant in explaining the level of personal savings. OZCAN et al. (2003) studied the determinant of private savings behavior in Turkey and found that income level, financial depth and measures, inflation were positively correlated to savings. ATHUKORALA and TSAI (2003) found that income growth, aging of the population; changes in social security contributions and the availability of credit were significant determinants of saving performance. While interest rate had a significant positive impact, inflation seems to have a negative impact on savings. COHN and KOLLURI (2003) examined the long run relationship between per capita households saving and the real rate of interest, government savings and social security contributions. They found that savings are positively correlated to interest rate, but negatively to government savings and social security contributions. HONDROYIANNIES (2004) used cointegration approach in estimating the behavior of Greece households. He found that, in the long run, savings function is sensitive to fertility changes, old dependency ratio, real interest rate, liquidity and public finance. HARALD and HEIKO (2009) examine the demand for commercial bank deposits in Lebanon using Impulse response functions and variance decomposition analyses. They found that Domestic factors such as economic activity, prices, and the interest differential between the Lebanese pound and the U.S. dollar are significant in explaining deposit demand, as are external factors such as advanced economy economic and financial conditions and variables proxying the availability of funds from the Gulf while bank-specific variables, such as the perceived riskiness of individual banks, their liquidity buffers, loan exposure, and interest margins, bear a significant influence on the demand for deposits. ORJI (2012) studied the determinants of bank savings in Nigeria and the impact of bank savings and bank credits on Nigeria's economic growth from 1970-2006 using Distributed Lag-Error Correction Model and Distributed Model. He found that values of GDP per capita, Financial Deepening and Interest Rate Spread had a positive impact o size of private domestic savings while Real Interest Rate and Inflation Rate had a negative impact KANJ and EL KHOURY (2013) investigates the main determinants of non-residents deposits in Lebanese

commercial banks using monthly time series data covering January 2002 to January 2013. They found that non-residents' deposits are shaped differently between domestic and foreign currency. For instance, bank assets, interest rates, and some adverse political situations affect non-resident deposits in all its measures. BECKMANN et *al.* (2013) uses data from the Euro Survey of the Oesterreichische Nationalbank for ten Central, Eastern and Southeastern European countries to analyze the saving behavior of CESEE households between 2010 and 2011. They found that age as well as education and income had a positive impact on savings.

The main studies on determinants of savings using long run cointegration in Islamic banks were conducted by ROHMAH (2006), ZAINOL and KASIM (2010). Thus, ROHMAH used autoregressive distributed lag approach in Indonesia. The author found long run cointegration between Islamic bank deposits with Islamic and conventional rate of return on deposit, level of income and number of Islamic banks' branches. ZAINOL and KASIM examined the determinants of rate of return and total deposits in Islamic banking. They found that Islamic banks' rate of return and conventional banks' interest rate are cointegrated and have a long-run equilibrium.

3 METHODOLOGY

As presented above, the present paper aims to identify the determinants of Moroccan banks' savings and to examine the existence or not of long run relationship between bank-specific and macroeconomic variables and savings in Moroccan banks.

To do this, we first begin by the definition of dependant and explanatory variables. Based on the literature above and on data available, we select banks savings as the dependant variable and bank-specific and macroeconomic variables as explanatory ones. Bank-specific variables are logarithm of the total assets of the bank LAGA to measure the size of banks; external funding to total liabilities EFL; equity to total assets ETA; while macroeconomic variables are: growth rate of gross domestic product GDP and foreign direct investment FDI.

Since various authors provide the use of cointegration to measure the relationship between savings and other independent variables (LOAYZA and SHAKER 2000, HONDROYIANNIES 2004, ROHMAH 2006, ZAINOL and KASIM 2010…), and as the aim of the present study is to examine the existence or not of long run relationship between bank-specific and macroeconomic variables and savings in Moroccan banks, we use cointegration approach.

The concept of cointegration was first introduced by Granger (1983, 1986) and then developed by Engle and Granger (1987). The existence of cointegration relationship, between two variables or more, means that these variables are do not drift too much apart and they are long run correlate… even though the series themselves may contain stochastic trends (non-stationary) (RIFKI, 2013). However, the linear combination of these variables (individually non stationary) may be stationary (DICKEY, 1991).

To conduct cointegration test, we first begin with unit root test. We use Augmented Dickey Fuller (DICKEY and FULLER, 1979) test and PHILLIPS-PERON (PP) unit root test to test the stationary. All the variables must be integrated at the same order. We apply then JOHANSEN JUSELIUS cointegration test to test the cointagration and to evaluate the existence of long-run relationship between the variables. JOHANSEN test was developed by JOHANSEN (1988) and JOHANSEN and JUSELIUS (1990). The JJ test is a multivariate cointegration test which can test the presence of multiple cointegrating vectors.

The data used in this paper are obtained from annual reports and annual financial statements of the commercial Moroccan banks for the period 2001-2012 and from databases of the World Bank, the International Monetary Fund and the Moroccan High Commission for Planning. Our study concerns Moroccan commercial banks, thus we have listed the various existing banks in Morocco in the last decade during a minimum of seven years to capture the effects of the financial crisis. We then selected banks that have existed throughout the study period and whose financial statements are available. We obtained eight banks which are the largest Moroccan banks.

4 RESULTS

As presented above, Augmented Dickey Fuller test and Phillips-Peron (PP) unit root test are conducted to test the stationary of time series. All the variables have unit root at level, they are not stationary at level but when convert them to first difference, they become stationary. All the variables must be integrated at the same order so we can run JOHANSEN JULISIUS test. Table 1 presents results of those tests. We remark that, using AUGMENTED DICKEY-FULLER and PHILLIPS-PERRON tests, all variables (deposits, logarithm of the total assets of the bank, external funding to total liabilities, equity to total assets, growth rate of gross domestic product and foreign direct investment) are non stationary at levels and stationary in the first difference (statistically representative at 5% level for deposits, logarithm of the total assets of the bank, external

funding to total liabilities, equity to total assets, growth rate of gross domestic product and at 10% for foreign direct investment). We conclude that these variables are integrated of the order 1 I(1).

Results obtained after the application of Augmented Dickey Fuller test and Phillips-Peron (PP) unit root test allow proceeding to JJ test. Thus, since the cointegration test is sensitive to the lag structure of VAR model, optimal lag length needs to be determined before conducting the test. Based on the Schwarz Criterion test, lag 1 is suggested as the optimal lag length (KASRI and KASSIM, 2009). In order to determine the vector autoregressive lag order, AIC and SC are used. The optimal lag length for deposits is 2.

Table 2 presents results obtained using JOHANSEN-JUSELIUS cointegration test. Two cointegrating vectors in Trace statistics are shown by the fact that 191,7717 and 100,3713 are respectively greater than 95,75366 and 69,81889 (5 percent critical value). Similarly two coitegrating vectors in Max-Eigenvalue are shown by the fact that 91,40041 and 56,11137 are respectively greater than 40,07757 and 33,87687 (5 percent critical value). These mean that deposits and its determinants namely logarithm of the total assets of the bank LAGA to measure the size of banks; external funding to total liabilities EFL; equity to total assets ETA; while macroeconomic variables are: growth rate of gross domestic product GDP and foreign direct investment FDI are found to be cointegrated. In short, the presence of cointegration between deposits and others variables provide evidence that these variables share a long-run relationship. Therefore, it concludes that there is a long run equilibrium governing the relationship among the variables.

Table 1: Unit root (ADF and PP) tests

Variable	ADF TEST		PP TEST	
	At level	1st difference	At level	1st difference
DEPOSITS	-1,32	-2,11*	-1,55	-2,26*
LAGA	-1,83	-3,20**	-1,83	-3,20**
EFL	-2,82	-2,79*	-2,24	-2,98*
ETA	-3,09	-4,19*	-3,09	-4,19*
GDP	-6,00	-4,67*	-6,00	-6,65*
FDI	-2,65	-4,77*	-2,65	-4,77*

*Variable statistically representative at the: * 5% level, **10% level*

Table 2: JOHANSEN-JUSELIUS cointegration test

Hypothesized No. of CE(s)	Trace statistic	5% Critical Value	Max-Eigen Statistic	5% Critical Value
None*	191,7717	95,75366	91,40041	40,07757
At most 1*	100,3713	69,81889	56,11137	33,87687
At most 2	44,25994	47,85613	25,59350	27,58434
At most 3	18,66643	29,79707	13,29330	21,13162
At most 4	5,373137	15,49471	4,665772	14,26460
At most 5	0,707365	3,841466	0,707365	3,841466

5 CONCLUSION

The present paper aims to identify the determinants of Moroccan banks' savings and to examine the existence or not of long run relationship between bank-specific and macroeconomic variables and savings in Moroccan banks using cointegration approach.

Based on the literature review and on data available, we select banks savings as the dependant variable and bank-specific and macroeconomic variables as explanatory ones. Bank-specific variables are logarithm of the total assets of the bank LAGA to measure the size of banks; external funding to total liabilities EFL; equity to total assets ETA; while macroeconomic variables are: growth rate of gross domestic product GDP and foreign direct investment FDI.

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